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Investigating the influence of clinico-socio-demographic factors on ocular disorders in diabetes mellitus: A study from western Uttar Pradesh

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ABSTRACT

Background: The study aims to investigate the correlation between clinico-socio-demographic factors and ocular diseases in diabetic patients and assess the knowledge of patients with diabetes mellitus regarding diabetes-related ocular diseases.

Materials and Methods: This cross-sectional study examined 120 diabetic patients referred from the Diabetic clinic. Clinico-socio-demographic data was analysed to understand ocular disease correlations and guide interventions. Anthropometric and medical history data were gathered using a self-developed questionnaire. Biochemical parameters, fasting, postprandial glucose and HbA1c levels were measured. Assessment of Awareness and experiences of diabetic ocular disease with a scoring system was done. Ocular exams (slit lamp, intraocular pressure, and fundus checks) were conducted by an ophthalmologist in the Ophthalmology OPD.

Results: The study found that the most prevalent ocular disease in diabetic patients was cataract (52.5%), followed by diabetic retinopathy (13.33%). Demographic factors showed significant associations with ocular diseases ($p < 0.05$).

Conclusions: The research identified a notable ocular disease prevalence among diabetes patients, with socioeconomic factors impacting treatment access and causing lasting eye damage. Awareness of diabetes and its complications was moderate, highlighting the need for enhanced education via diverse channels and healthcare facilities to enable early detection and improved outcomes.

1. Introduction

Diabetes is a burgeoning health issue in India with nearly 77.4 million patients second highest in the world after China. Prevalence is faster in low and middle-income populations in India.[1] Diabetes causes micro and macrovascular complications in patients affecting the lens and retina.[2]

Furthermore, Diabetic retinopathy (DR), diabetic macular edema (DME), glaucoma, diabetic papillopathy and central retinal vein occlusion are major complications and are important causes of blindness in our country. However limited studies on patient awareness in Western UP, India, amplifies concerns in the diabetes capital. Addressing this gap promptly is crucial for ocular health preservation.

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2. Materials and Methods

This was a cross-sectional study conducted at Tertiary Care Government Hospital, situated in Eastern Uttar Pradesh, India from August to September 2022. The participants included diabetic patients visiting the hospital. The study followed the principles of the Helsinki Declaration and adhered to the ethical guidelines established by the Institutional Ethics Committee. The study commenced after receiving approval from this committee, ensuring ethical oversight. Additionally, written informed consent was obtained from all participants, confirming their understanding and willingness to take part in the study. The outpatient clinics, specifically those referred from the Diabetic Clinic for ophthalmic examination.

The sample size for the study consisted of 120 patients who were visiting the diabetes clinic and willing to participate. Convenience sampling was employed to include participants in the study. Inclusion criteria all known cases of diabetes mellitus above 18 years of age visiting the diabetes clinic. Exclusion criteria were applied to patients with conditions that could independently influence ocular diseases, such as hypertension, nephropathy, anaemia, and hyperlipidaemia.

The recruitment process involved enlisting subjects visiting the ophthalmology outpatient department (OPD). Informed consent was obtained from each participant, and data was collected using a self-designed and pre-validated questionnaire Figure 1.

Several parameters were considered during the study, including the participant's sociodemographic profile (such as gender, age, marital status, religion, education level, income level, employment status, family type, type of community, and food preferences). Additionally, detailed medical history information was gathered with the help of a self-developed questionnaire with the help of eye care professionals and community ophthalmologists.

Biochemical parameters, including fasting plasma glucose, postprandial plasma glucose, and HbA1c levels, were measured. The glucose levels were assessed using an automated analyser (ProXL), while HbA1c was measured using the Bio-Rad D10 analyser both instruments were available at the central lab and are provided by the POCT group, Lucknow.

The questionnaire contained specific questions aimed at assessing the awareness level [A] and Experiences [E] related to diabetic ocular disease. Each awareness-related question was assigned a Score of 1 for a "yes" response and 0 for a "no" response. The mean score was calculated for each Group of questions. The awareness of the study participants was evaluated using the scale presented in Figure 1. Ocular examinations, including slit lamp examination, intraocular pressure measurement, and fundus examination, were conducted by an ophthalmologist in the Eye OPD.

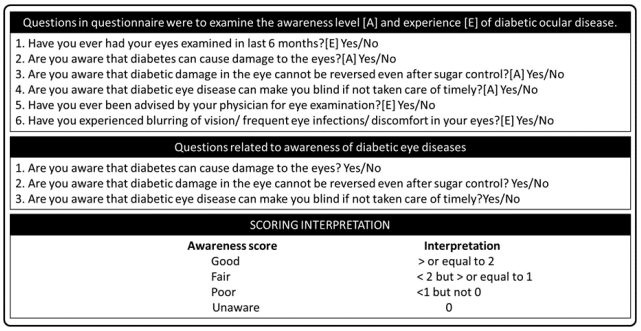

Figure 1: Questionnaire used to assess awareness of diabetic ocular diseases and scoring interpretation

3. Results

This cross-sectional study included 120 diabetic patients visiting the outpatient clinics of a tertiary care hospital in western Uttar Pradesh, India. The mean age of the study population was 53.92 years, ranging from 19 to 81 years. The sample consisted of 49.17% males and 50.83% females. The majority of participants (36.67%) were illiterate, while 40.83% had studied till Class 12 and 22.5% had higher education. Out of the total participants, 35.83% were employed, and 64.16% were non-working Table 1. Most participants (72.5%) belonged to rural areas, while 27.5% resided in urban areas. The study included 66.66% of participants from higher socioeconomic classes (BG Prasad I, II) and 33.33% from lower socioeconomic classes (BG Prasad III, IV, V).

Table 1: Demographic features of study population

Characteristics	**n=120**
Sex Male (n=59, 49.17%)	Female (n=61, 50.83%)
Mean Age	53.92 yrs.
Male (54.54 yrs.)	Female(53.32yrs)
Educational Status	
Illiterate	44(36.67%)
< or equal to class 12	49(40.83%)
> class 12	27(22.5%)
Working status	
Working	43(35.83%)
Non-working	77(64.16%)
Residence	
Urban	33(27.5%)
Rural	87(72.5%)
Socio economic status (BG PRASAD#)	
High SEC*	80(66.66%)
Low SEC	40(33.33%)

*SEC= socio-economic class
#BG PRASAD- modified BG Prasad classification for May 2021.[3]

The questionnaire used in the study assessed the awareness level among participants regarding diabetic ocular diseases. The results showed fair awareness in all age

groups, except for poor awareness in elderly participants above 75 years and young patients below 30 years Figure 2. Both men and women demonstrated fair awareness, with men scoring 1.54 and women scoring 1.06. Urban participants had a higher awareness score of 1.84 compared to rural participants with a score of 1.09. Education level significantly influenced awareness, with illiterates having poor awareness (0.73), participants with schooling till Class 12 showing fair awareness (1.38), and those with higher education demonstrating good awareness (2.07).

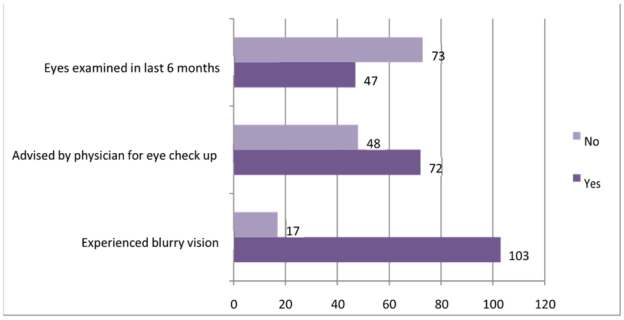

Figure 2: Response to experience related questions and their responses given by subject

Participants from higher socioeconomic status had fair awareness (1.46) compared to those from lower socioeconomic status (0.975). Awareness of diabetic eye diseases was fair among participants with normal and deranged HbA1c levels. Statistical analysis indicated a significant association between awareness and education level as well as place of residence. However, age, gender, working status, socioeconomic status, and HbA1c level did not show significant associations with awareness. Regarding experiences related to diabetic ocular diseases, 39% of participants had their eyes examined in the last six months, 60% reported being advised by their physician for eye examination, and 85.8% experienced ocular symptoms such as blurred vision, frequent eye infections, or eye discomfort. The prevalence of diabetic eye diseases in the study population was as follows: cataract (52.5%), diabetic retinopathy (13.33%), diabetic macular edema (7.5%), and glaucoma (5%) Figure 3.

Demographic characteristics associated with ocular diseases were examined. Cataract was more common in the age groups of 46 to 60 and 61 to 75, with higher prevalence among females, rural residents, illiterates, and non-working participants. Most cataract cases showed higher HbA1c levels. Diabetic retinopathy was more prevalent in the age group of 61 to 75, males, rural residents, nonworking participants, and higher socioeconomic statusTable 2. All cases of diabetic retinopathy had higher HbA1c levels and were known diabetic cases for more than 10 years. Diabetic macular edema and glaucoma were less frequent but showed higher prevalence among older age groups, females, rural

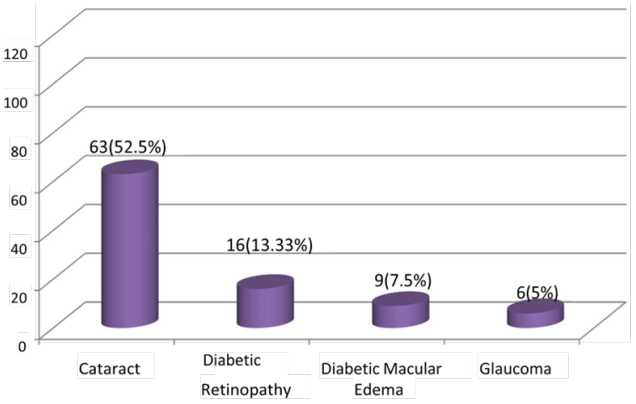

Figure 3: Frequency of eye diseases related to DM. Showing maximum no of cases for cataract is 52.5% & and the minimum for glaucoma is around

residents, illiterates, non-working participants, and higher socioeconomic groups. Higher HbA1c levels were observed in cases of diabetic macular edema and glaucoma as well.

Overall, the study highlighted the need for improved awareness and regular eye examinations among diabetic patients to prevent and manage ocular complications associated with diabetes.

4. Discussion

This cross-sectional study included 120 diabetic patients aged 19 to 81 years from a tertiary care hospital catering to both rural and urban populations. The mean age of the participants was 53.92 years, with a majority falling into the middle age group. The study found that cataract was the most prevalent ocular disease among diabetes patients, with a prevalence of 52.5%. Other studies by Alabdul Wahhab KM et al and Wen L et al reported cataract prevalence rates of 35.5% and 36.4%, respectively, which are lower than the findings of this study.[4,5]

The higher prevalence of cataract in this population highlights the need for specific awareness programs and interventions to reduce their occurrence. Although diabetes may not be the direct cause of cataract, it is known to be a contributing factor.[6] Cataract risk was higher in the middle-aged population, possibly due to age-related degeneration and the higher prevalence of diabetes. The study also observed a slightly higher prevalence of cataract in females, which aligns with the findings of Prasad M et al's study conducted in India.[7] Rural residents, illiterate individuals, and non-working groups had a higher prevalence of cataract compared to their counterparts. This can be attributed to factors such as delayed detection, lack of awareness, limited access to healthcare facilities, or financial constraints. These findings are consistent with studies conducted by Singh S et al. and Drinkwater JJ et al.[8,9] Cataract was significantly associated with increased HbA1c levels, as uncontrolled

Table 2: Demographic characteristics of ocular diseases in the study population

Cataract	Diabetic retinopathy	Diabetic macular edema	Glaucoma
Age Group			
<30	1(1.59%)	0	0	0
30-45	7(11.11%)	0	1(11.11%)	1(16.66%)
46-60	31(49.20%)	6(37.5%)	2(22.22%)	3(50%)
61-75	21(33.33%)	7(43.75%)	5(55.55%)	2(33.33%)
>75	3(4.76%)	3(18.75%)	1(11.11%)	0
Sex				
Male	27(42.86%)	10(62.5%)	4(44.44%)	2(33.33%)
Female	36(57.14%)	6(37.5%)	5(55.55%)	4(66.66%)
Residence				
Urban	14(22.22%)	5(31.25%)	2(22.22%)	2(33.33%)
Rural	49(77.78%)	11(68.75%)	7(77.77%)	4(66.66%)
Education				
Illiterate	29(46.03%)	5(31.25%)	4(44.44%)	2(33.33%)
< or equal to class 12	26(41.27%)	8(50%)	4(44.44%)	3(50%)
> class 12	8(12.69%)	3(18.75%)	1(11.11%)	1(16.66%)
Working Status				
Working	17(26.98%)	4(25%)	1(11.11%)	1(16.66%)
Non-working	46(73.01%)	12(75%)	8(88.88%)	5(83.33%)
	SES			
High SEC	40(63.49%)	13(81.25%)	8(88.88%)	3(50%)
Low SEC	23(36.50%)	3(18.75%)	1(11.11%)	3(50%)
HbA1c				
Normal	1(1.59%)	0	0	1(16.66%)
High	62(98.41%)	16(100%)	9(100%)	5(83.33%)
Duration of DM				
<5years	21(33.33%)	1(6.25%)	1(11.11%)	3(50%)
6-10 years	28(44.44%)	4(25%)	1(11.11%)	3(50%)
>10 years	14(22.22%)	11(68.75%)	7(77.78%)	0

blood glucose levels can lead to lens pathology.[10]

The study found a prevalence of 13.33% for diabetic retinopathy (DR), which is lower than the rates reported in other studies (ranging from 17.6% to 32.3%).[11,12] This could be due to early diagnosis and improved management of diabetes patients in the study region. Middle and older age groups (46 to 75) were most affected by DR, consistent with findings from studies by Gadkari SS et al. and Singh HV et al.[13] The prevalence of DR was higher in males (62.55%) compared to females (37.55%), as also observed by Reema et al.[12] A significant number of DR cases were found among rural residents (11 out of 16) and the non-working class (12 out of 16), likely due to limited access to healthcare facilities. Higher socioeconomic status (SEC) individuals had a higher prevalence of DR (81.25%), possibly due to increased awareness and more frequent fundus examinations. In terms of diabetes duration, only one case of DR was observed in patients with less than 5 years of diabetes, while 11 cases had a duration of more than 10 years, consistent with the findings of Kai S et al.[14] HbA1c levels and duration of diabetes were significantly associated with DR, aligning with previous studies.[7,12,15–17] Prolonged uncontrolled blood glucose levels can lead to microvascular complications and retinal damage. However, some studies have found disease duration in diabetes to be a significant risk factor independent of glycemic control adequacy.[18]

The prevalence of diabetic macular edema (DME) in this study was 7.5%, which is lower than the 9.1% reported by Rajalakshmi R et al,[19] but higher than the rates reported by Teo ZL and Singh HV (4.07% and 4.49%, respectively).[11,14] This highlights the importance of early and regular fundus examinations for the early detection of macular edema.

5. Conclusion

In the current cross-sectional study we conclude that ocular disease is common in diabetes mellitus. The demographic profile which includes socioeconomic factors significantly affects the ability to make health choices and afford medical care. The poor patient does not seek timely treatment leading to irreparable ocular damage. Awareness level was found to be fair in our study group. Good knowledge about diabetes will help in early detection of complications in a vulnerable group. It is extremely important to spread knowledge through television, posters, newspapers and outreach programs. The health care centre will play a crucial role in motivating and inculcating health-seeking behaviour

among people.

The study did not control for other potential confounding factors. Other factors such as smoking, alcohol use, and family history of diabetes may also influence the risk of developing ocular diseases.

6. Author Contributions

Amrita Sinha: Conducted literature searches and contributed to clinical and experimental studies, as well as data acquisition. Nandita Chaturvedi: Involved in design, definition of intellectual content, clinical and experimental studies. Anurag Srivastava: Contributed to the design, definition of intellectual content, and data analysis; participated in manuscript review. Utkarsh S. Tomar: Contributed to, manuscript preparation, editing, and review. Manisha Singh: Conceptualized the project, contributed to design and intellectual content; participated in manuscript editing, review, and served as a guarantor.

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8. Conflicts of Interest

The authors declare no conflicts of interest.

9. Data Availability Statement

The data supporting the findings of this study are available from the corresponding author upon reasonable request and will be made available on demand.

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